The Giovanni News

GODDARD EARTH SCIENCES DATA & INFORMATION SERVICES CENTER (GES DISC)

From the Editors

Greetings:

This month's newsletter provides an update on the Data-enhanced Investigations for Climate Change Education (DICCE) Project. The DICCE project team has been discussing how to convert its dedicated Giovanni portals to utilize Giovanni-4. Meanwhile, the current portals are being effectively used in the classroom. This month's article provides two examples.

The Research Highlight from February is about evapotranspiration – evaporation from the Earth's surface and transpiration from the Earth's plant life. The highlighted paper examines the effect of aerosols on this fundamental process in the hydrologic cycle.

And, following up on our Giovanni-4 development update from last month, an example of a quasi-climatology is discussed.

Regards,
Jim Acker and Wainie Youn, Editors

In this Issue

Research Highlight: Effect of aerosols on evapo-transpiration

B.S. Murthy, R. Latha, Manoj Kumar, and N.C. Mahanti (2014). Effect of aerosols on evapo-transpiration.
Atmospheric Environment, **89**, 109-118. http://dx.doi.org/10.1016/j.atmosenv.2014.02.029
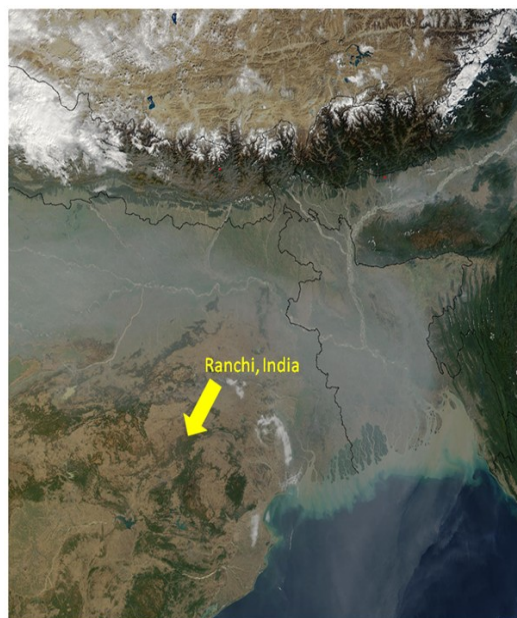
MODIS image of eastern India, Bangladesh, Nepal, the Himalayan mountain range, and the southern Tibetan Plateau, acquired on January 14, 2002. The approximate location of the study site in Ranchi, India is shown. This region can be significantly affected by atmospheric aerosols, as can be seen here.

In this paper, the authors examined the influence of atmospheric aerosols on evapo-transpiration rates for a site in India. The process is important to climate change studies, because the absorptive and reflective properties of aerosols can reduce incoming solar radiation at the Earth's surface. The data collection site for the study was located at the Birla Institute of Technology in the city of Ranchi, eastern India. Both a sky radiometer and a meteorological tower are deployed at this site.

In order to estimate aerosol radiative forcing (ARF), direct measurements of aerosol optical depth (AOD) were made with the sky radiometer. To compare with these direct observations, a model ARF was calculated for the same days, using the "SBDART" model, which provides AOD, single scattering albedo (SSA), alpha, and the asymmetry parameter at 500 nm. Daily water vapor, ozone, and surface albedo from MODIS-Terra for input to the model ARF were obtained from Giovanni.

Over the study period, which included the winter, pre-monsoon, and monsoon seasons from February to the beginning of August, significant variability was noted in many of the parameters. A wide range of aerosol sizes was present in the area during the study, particularly in mid-March, when the area was affected by smoke from biomass burning. The authors also described a reduction in the radiative forcing efficiency (RFE) from winter into the monsoon season, due to an apparent decrease in the concentration of absorbing aerosols.

The researchers found that, on average, aerosols reduced the visible radiation energy by 27%, evapotranspiration by 14%, and sensible heat flux by 16%. The effect of aerosols was greater when evapotranspiration rates were higher, which means the aerosol effect in reducing evaporation was greater over wet soils than dry soils. Other factors, such as wind speed and humidity, can also influence evapotranspiration rates; thus, the authors considered the study results to be preliminary and will need further investigation with modeling.

Recently, two classroom projects using the Giovanni portals of the Data- enhanced Investigations for Climate Change Education (DICCE) Project have been described. The first project write-up was done for teachers and students in Europe who were participating in the GLOBE Project. Entitled "Visualizing MODIS Aerosol Optical Thickness data," the write-up was authored by Elise Hendriks of the Royal Netherlands Meteorological Institute (KNMI). Step-by-step instructions are provided for two example activities. The first activity describes how to use the DICCE portal to create a visualization of MODIS aerosol optical thickness (AOT) data for a wildfire event that had spread a pall of smoke over parts of southern Scandinavia in early July 2013. The second activity describes the creation of an AOT time series coinciding with the European GLOBE Aerosols Spring Measurement Campaign, during the month of May 2013, for a school location in Amsterdam.

More information on the GLOBE Project at KNMI can be found here: http://www.knmi.nl/globe/

2. Second, go to the *Parameter* section. In the box *Moderate Resolution Imaging Spectro-radiometer (MODIS)* aerosol measurements obtained by either one of the MODIS instruments, on board of Aqua and Terra, is listed. To plot MODIS Aqua AOT, select *Aerosol Optical Depth at 550 nm* at the top of the list (where *Data Product Info* reads: MYD08_D3.051, MODIS-Aqua Ver. 5.1, 2002/07/04 - 2013/09/08).
3. Then, go to the *Temporal* section and select the date, 8 July 2013.
4. In the *Select Visualization* section you can choose the type of visualization. Choose here, *Lat-Lon map, Time-averaged*. By clicking *Edit Preferences* you can make edit the visualization preferences (for example, change the plotting scale or palette color). You don't need to change these preferences for now. The standard plotting preferences are good enough for a first view and can also be edited later on.
5. Now click the **Generate Visualization** button to view the selected satellite data. It may take a minute to see page with *Visualization Results*, containing the map shown in **Figure 5**. The elevated AOT levels over the southern part of Scandinavia reveal the forest fire smoke plume.

Figure 5. MODIS Aqua AOT over Europe at 8 July 2013 revealing the forest fire smoke plume over southern Scandinavia (in red and yellow).
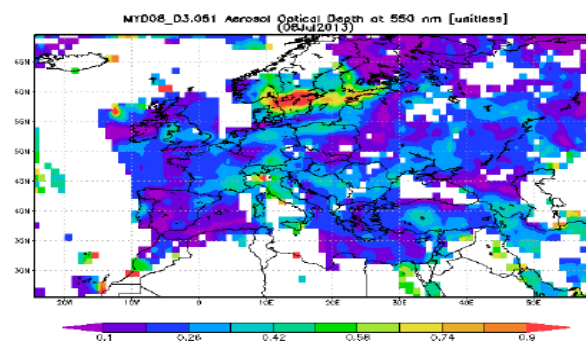
Excerpt from the GLOBE Project activity demonstrating how to visualize a wildfire smoke plume with MODIS AOT data in DICCE Giovanni.

The second project write-up, authored by DICCE Principal Investigator Daniel Zalles, describes a case study of how 7th, 8th, and 10th grade students in the "Green Kids" environmental science program utilized DICCE. Green Kids students endeavored to create a flash flood prediction model for seven sites in California. The students created a time series, in Excel, of temperature, cloud fraction, and rainfall rate data, acquired from DICCE Giovanni, and then noted when flash floods had occurred on the time series. For the Mojave Desert region, one of the clear associations was with high summer temperatures, which likely contribute to powerful convective thunderstorms.

The case study can be downloaded from SRI International: http://sriinternational.com/sites/default/files/publications/01_youth_explore_article.pdf

Giovanni-4 Development Update

In last month's newsletter, we mentioned the "quasi-climatology" capability that was on the Giovanni-4 beta test site and which will soon be available on the operational public Web site. So, for this issue, we tried it out, using the TRMM monthly rain rate data product.

For fun, the region we investigated was the state of New York. The month selected was August, because it's an important month for the growth of wine grapes. The Finger Lakes region of New York State, south of Lake Ontario in the western part of the state, is a wine-growing region, and rainfall in August is important to the quality of the grapes. The Finger Lakes create "micro-climes" in the valleys in which the vineyards are located (at least according to the tourist brochures), which allow for different growing conditions in the region. The growers would like some rain, but not too much, and mostly sunny days, so the vines can put all that energy into growing grapes.
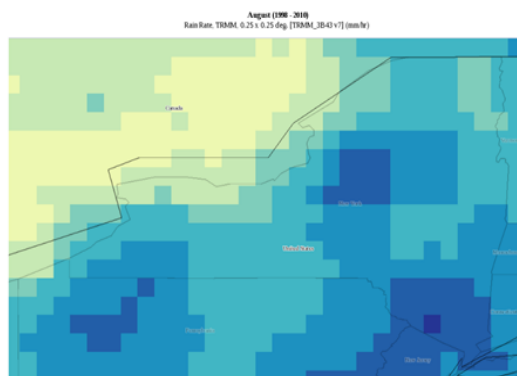
The quasi-climatology period selected was 1998-2010. The map shows that, during this period, there was heavier rainfall in August to the east of the Finger Lakes region, roughly corresponding to the location of Syracuse, which could indicate an urban rain-seeding effect due to pollution (i.e., providing rain nucleation particles). Over the Finger Lakes region, there is a gradient in the rain pattern, with less rain closer to Lake Ontario and more rain to the south.

What wine aficionados could now do is to compare this quasi-climatology to precipitation maps, for specific months during the quasi-climatology period, and use this information to determine which vintage years of New York State Finger Lakes wines to buy.

Top: August TRMM rain rate quasi-climatology, 1998-2010. **Bottom:** Map of New York State. The Finger Lakes are southeast of Rochester and southwest of Syracuse.